J. Agric. Sci. Mansoura Univ., 33(5): 3499 - 3503, 2008

TRUE PARAMETERS OF EGYPTIAN BEET MOLASSES

Awad-Allah, M. A. A.
Home Economic Department, Faculty of Specific Education, South Valley University, Qena, Egypt.

ABSTRACT

From the fundamental equation: $Y = A + (B \times X)$ relations between apparent and true parameters (brix, sucrose, and purity) of Egyptian beet molasses; which obtained from Delta Sugar Company, Kafr El-Sheikh governorate, Egypt, during 2006/2007 production season; had been deduced (whereas, Y = true parameter and X = apparent parameter) by identification of constants A and B.

Application of the equations was illustrated by example connected with sugar analysis for quality control purposes. The equations could be applied to the apparent calculations set up by a calculator or computer, to determine true parameters; which consider a rapid, simple and accurate method.

INTRODUCTION

Since most of figure obtained in sugar analysis are not absolute, sugar house calculations are mainly approximations, but they are accurate enough to give comparable results.

Purity of beet molasses is considered a very important factor indicating the sugar loss in molasses for sugar industry, which is a useful concept that allows estimation of the amount of sucrose that can be recovered from the solution (Dexter *et al.*, 1967). Presence of optically active matters as amino compounds are influence on sucrose parameter (Schiweck *et al.*, 1993 & Schiweck, 1998); so, the purity of molasses varied inversely with the non-sucrose/water ratio, non-sucrose matters may include volatile matters which influence on brix parameter (Vel, 1974). Thus, true sugar loss to molasses and true brix (true purity) provides useful estimates of the processing quality of sugar beet.

Apparent purity was widely used in sugar factory for control purposes; the test had a general acceptance because of its convenience and simplicity. On the other hand, true purity had value in comparing work quality control of different factories and in research work but is of limited application because of the time required and the difficulty of determining the two factors involved, (true brix and true sucrose), especially dry solids (Meade and Chen, 1977).

Therefore, different equations are required to calculate true purity in rather short time.

MATERIALS AND METHODS

Materials:

Beet molasses samples were obtained from Delta Sugar Company, Kafr El-Sheikh governorate, Egypt, during 2006/2007 working season.

Methods:

-Apparent brix was determined by Abbè refractometer using a 1: 1 diluted sample at 20°C.

-True brix (total solids), direct polarization (apparent sucrose), and invert polarization (true sucrose) were determined according to *ICUMSA* (1994) method GS 1 – 7 (Intl Commission 1994).

-Apparent purity represents the percentage of apparent sucrose to the apparent brix.

-True purity represents the percentage of invert polarization in the total solids content of the molasses.

Statistical analysis:

Data were subjected to analysis for correlation coefficient according to Dowdy *et al.*, (2004), and for standard deviation according to Jaisingh (2000). Different equations were obtained using Microcal Origin "Version 5", and using the Statistical Package for the Social Science (SPSS) analysis without anguish version 12.0 for windows (Coakes, 2005).

RESULTS AND DISCUSSION

Data of apparent and true parameters (brix, sucrose, and purity) of Egyptian beet molasses are presented in Tables 1, 2 and 3.

Table (1): Relationship between apparent brix and true brix of beet molasses.

Sample	Apparent brix	True brix
1	81.60	80.90
2	81.00	80.00
3	81.40	81.19
4	81.00	80.20
5	80.60	80.06
6	80.80	79.90
7	80.80	80.00
8	80.20	79.50
Mean	**80.925**	**80.218**

SD = 0.2547.

Each figure represents the average of 50 determinations.

Table (2): Relationship between apparent sucrose and true sucrose of beet molasses.

Sample	Apparent sucrose	True sucrose
1	48.36	49.18
2	49.00	49.18
3	48.88	49.12
4	48.76	49.44
5	48.88	49.29
6	49.12	49.47
7	49.56	49.68
8	49.44	49.71
Mean	**49.00**	**49.38**

SD = 0.22009.

Each figure represents the average of 50 determinations.

The results revealed that the correlation coefficient between apparent and true parameters under investigation were 0.80482, 0.45419 and 0.77637; respectively.

Table (3): Relationship between apparent purity and true purity of beet molasses.

Sample	Apparent purity	True purity
1	59.26	60.79
2	60.49	61.48
3	60.05	60.50
4	60.20	61.65
5	60.65	61.57
6	60.69	61.91
7	61.33	62.10
8	61.65	62.53
Mean	**60.54**	**61.556**

SD = 0.3454.

The estimation of true brix, sucrose, and purity of Egyptian beet molasses is based on a simple equation:

$Y = A + (B \times X)$

Where:

Y = true parameter

A and B = constants

X = apparent parameter

Three different equations were obtained as follow:

I- Using Microcal Origin "Version 5" program:

True brix = - 11.94915 + (1.13893 × apparent brix).

True sucrose = 40.66284 + (0.17843 × apparent sucrose).

True purity = 14.29634 + (0.78080 × apparent purity).

Example:

If apparent brix of beet molasses = 80.925 % and apparent sucrose = 49.00 %.

Calculate the true purity is:

True brix = - 11.94915 + (1.13893 × 80.925) = 80.2187602 %.

True sucrose = 40.66284 + (0.17843 × 49.00) = 49.40591 %.

Apparent purity = (49.00 / 80.925) 100 = 60.54989 %

True purity = 14.29634 + (0.78080 × 60.54989) = 61.5736941%

2- Using the Statistical Package for the Social Science (*SPSS*) analysis without anguish version 12.0 for windows:

True brix = 85.48829467871 + (- 0. 0650702811245 × apparent brix).

True sucrose = 50.77039245283 + (- 0.02830188679245 × apparent sucrose).

True purity = 47.26388829249 + (0.2362423473325 × apparent purity).

Example:

Calculate the true parameters using the same previous apparent parameters are:

True brix = 85.48829467871 + (- 0. 0650702811245 × 80.925) = 80.222482 %

True sucrose = 50.77039245283 + (- 0.02830188679245 × 49.00) = 49.3836 %

Apparent purity = (49.00 / 80.925) 100 = 60.54989 %
True purity = 47.26388829249 + (0.2362423473325 × 60.54989) = 61.5683359 %

From the previous equations, values of true brix, sucrose, and purity were calculated and recorded for different values of A and B constants.

Table (4) illustrates the calculated statistical values of A and B constants using Microcal Origin and *SPSS* programs.

Table (4): Constants A and B for different parameters of beet molasses.

Parameter	Statistical program	Constants	
		A	B
Brix	Microcal Origin	- 11.94915	+1.13893
	SPSS	+85.48829	- 0. 06507
Sucrose	Microcal Origin	+40.66284	+0.17843
	SPSS	+50.77039	- 0.02830
Purity	Microcal Origin	+14.29634	+0.78080
	SPSS	+47.26389	+0.23624

The equations could be applied to the calculations set up by a calculator or computer.

In conclusion the recommendations in equations are set up in particular for Delta sugar plant, Egypt.

REFERENCES

Coakes S. (2005). SPSS: Analysis without Anguish Version 12.0 for Windows Singapore, CMO Image Printing Enterprise.

Dexter S. T.; M. G. Frankes and F. W. Snyder (1967). A rapid and practical method of determining extractable white sugar as may be applied to the evaluation of agronomic practices and grower deliveries in the sugar beet industry. J. Am. Soc. Sugar Beet Tech., 14: 433-454.

Dowdy S.; S. Wearden and D. Chilko (2004). Statistics for research. Third edition, New Jersey, John Wiley & Sobs INC. p. 238.

ICUMSA (1994). International Commission for Uniform Methods of Sugar Analysis. Methods Book, ICUMSA, England.

Jaisingh L. (2000). Statistics for the Utterly Confused. New York, McGraw-Hill. P. 47.

Meade G. P. and J. Chen (1977). Cane Sugar Handbook. Tenth Edition. A Wiley - Inter-science Publications, John Wiley and Sons, New York, London, Sydney, Toronto.

Schiweck H. (1998). Influence of individual non-sugars on molasses formation. Section 12.2.3.1.1, pages 685-686. In var der Poel, P. W., Schiweck H. and Schwartz T. K. (eds.) Sugar Technology. Verlag Dr. Albert Bartens, Berlin. 1118pp.

Schiweck H.; C. Jeanteur-DeBeukelaer and M. Vogel (1993). The behavior of nitrogen containing non-sugar substances of beet during the sugar recovery process. Zuckerind, 118: 15-23.

Vel M. (1974). The low of grade masssecuite on molasses exhaustion. The Sugar Journal, September, 31-33.

القياسات الحقيقية لمولاس البنجر المصري

مصطفى احمد علي عوض الله
قسم الاقتصاد المنزلي – كلية التربية النوعية – جامعة جنوب الوادي – قنا

من المعادلة الرئيسية $Y = A + (B \times X)$ تم استنتاج العلاقة بين القياسات الظاهرية ، والقياسات الحقيقية لكل من البركس والسكروز والنقاوة لمولاس بنجر السكر المصري الذي تم الحصول عليه من شركة الدلتا للسكر- محافظة كفر الشيخ خلال موسم التصنيع ٢٠٠٦/٢٠٠٧م (حيث Y تمثل القياس الحقيقي ، X تمثل القياس الظاهري) بالتعرف على قيمة كل من الثوابت A , B .

وتطبيق هذه المعادلات قد تم توضيحه بمثال مرتبط بتحليلات السكر لمراقبة الجودة. ويمكن تطبيق هذه المعادلات على الحسابات الظاهرية التي تم الحصول عليها باستخدام الة حاسبة أو كمبيوترلتقدير القياسات الحقيقية – وتعتبر هذه الطريقة سريعة ، وبسيطة ، ودقيقة.